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"Inside-Out" Well for Simultaneous Soil Vapor and Ground Water Sampling

by Joel Hubbell, Idaho National Engineering and Environmental Laboratory

Researchers at the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory (INEEL) have developed a combination well for simultaneous gas and ground water sampling through the same borehole. Design of the "inside-out" well, in which gas sampling tubing and ports are attached on the exterior of the well casing, provides a means for simpler and less expensive sampling than conventional techniques. This technology was demonstrated initially at INEEL, and currently is used to monitor volatile organic compounds at various U.S. locations in the West and Southwest, including the Sandia National Laboratory, Los Alamos National Laboratory, and the Tucson Airport.

Conventional designs for combined ground water and gas sampling wells place the gas sampling tubing inside the well casing, and sampling ports penetrate the casing at various depths. This approach physically interferes with the placement of ground-water pumps and samplers lowered within the well, and usually requires an inner casing. In the inside-out well, ground water and soil gas sampling activities do not interfere with each other, so the well can be used simultaneously for monitoring and remediation purposes, allowing direct comparison of data. The well is assembled easily in the field before the casing is placed in the borehole. Precise gas port depths are known, which reduces the potential for grouting over the ports after the casing is set.

Demonstration of the combination well at INEEL's Radioactive Waste Management Complex in Idaho involved the use of 7 wells constructed to depths up to 243 meters within a thick vadose zone (approximately 180 meters) consisting of basalt with fracture and cinder zones, and sedimentary interbeds. Each well contained 3-9 gas sampling ports, installed at depths ranging from 7.2-178 meters, to track chlorinated solvent vapors. Figure 1 provides a schematic diagram of the combination sampling well. The cost savings for these wells were estimated at $30,000 per well when compared to drilling separate wells.

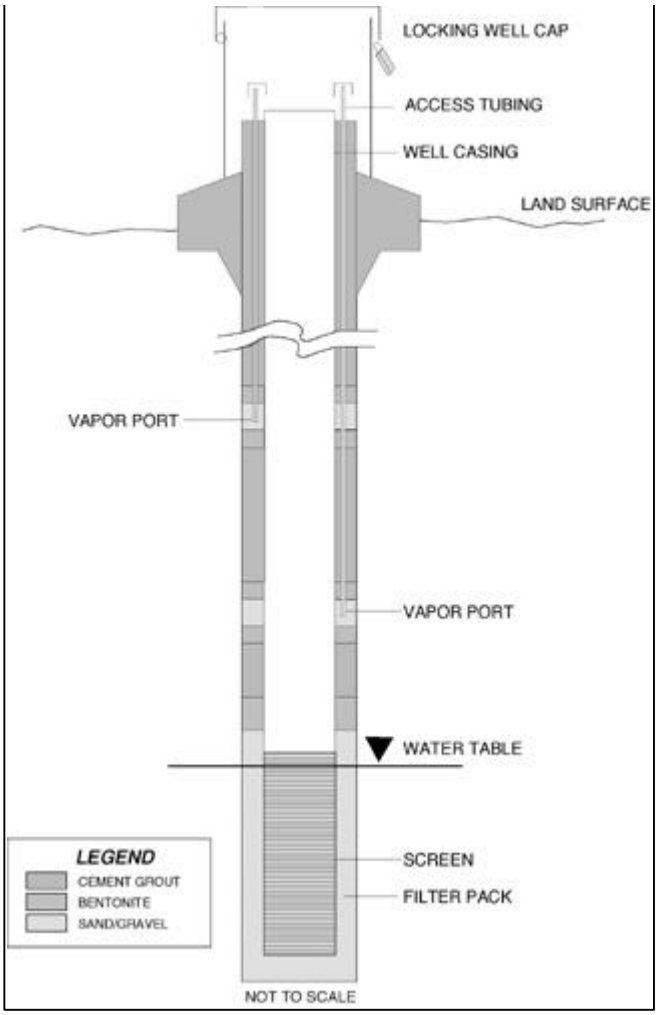

Figure 1. Schematic Diagram of Combination Sampling Well

This technology reduces the cost of long-term projects in which vapor sampling has been found to be more effective than soil matrix sampling for VOCs. For example, 6 vapor extraction wells at depths of 43-148 meters are used to monitor vapor extractions at a 2-acre chemical waste landfill at Sandia National Laboratory. Compared to an alternate system requiring 6 separate boreholes for soil gas monitoring, the combination wells saved approximately $60,000. Users of the combination well also have found that the combination well is effective in angled boreholes to reach areas of interest without drilling through the waste site itself.

Simultaneous gas and ground water sampling with an inside-out well at INEEL

For more information, contact Joel Hubbell (INEEL) at 208-526-1747 or E-mail jmh@INEL.gov.